18.i) Find a vector in the direction of the $\vec{a} = \hat{i} - 2\hat{j}$, whose magnitude is 7 units.

$$\hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

$$|\vec{a}| = \sqrt{(1)^2 + (-2)^2 + (0)^2} = \sqrt{1+4} = \sqrt{5}$$

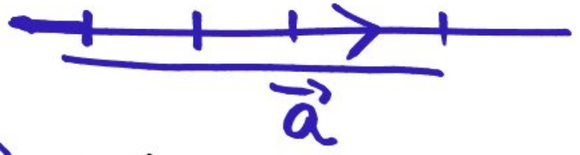
$$\hat{a} = \frac{\hat{i} - 2\hat{j}}{\sqrt{5}}$$

4 ba. = 8 Rs

5 bam = ?

1 ba = $\frac{8}{4}$ = 2 Rs

5 ba = 5 × 2 = 10 Rs



Vector in direction of $\vec{a}$ having Magnitude (7) Unit

$$7\hat{a} = \frac{7}{\sqrt{5}}(\hat{i} - 2\hat{j})$$

ii) Write a vector of the magnitude 9 unite in the direction of the vector $-2\hat{i}+\hat{j}+2\hat{k}$

Let $\vec{a} = -2\hat{i}+\hat{j}+2\hat{k}$

$$|\vec{a}| = \sqrt{(-2)^2+(1)^2+(2)^2}$$

$$= \sqrt{4+1+4}$$

$$|\vec{a}| = \sqrt{9} = 3$$

$$\hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

$$\hat{a} = \frac{-2\hat{i}+\hat{j}+2\hat{k}}{3}$$

$$9\hat{a} = \frac{9(-2\hat{i}+\hat{j}+2\hat{k})}{3}$$

$$\boxed{9\hat{a} = 3(-2\hat{i}+\hat{j}+2\hat{k})}$$

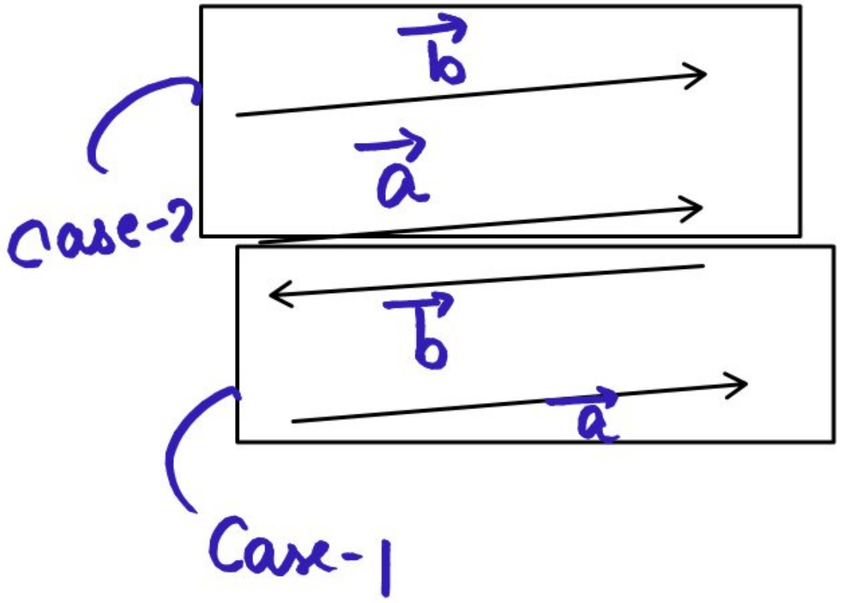
Ans

iii) Find vectors of the magnitude 5 units which are parallel to the sum of the vectors $\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$

$$\vec{a} + \vec{b} = (2\hat{i} + 3\hat{j} - \hat{k}) + (\hat{i} - 2\hat{j} + \hat{k})$$

$$= (3\hat{i} + \hat{j} + 0\hat{k})$$

$$\boxed{\vec{a} + \vec{b} = 3\hat{i} + \hat{j}}$$



$$|\vec{a} + \vec{b}| = \sqrt{9 + 1} = \sqrt{10}$$

$$\hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

$$\hat{a} = \frac{3\hat{i} + \hat{j}}{\sqrt{10}}$$

$$\text{Req. Vector } 5\hat{a} = \pm\frac{5}{\sqrt{10}}(3\hat{i} + \hat{j})$$

19.i) if the magnitude of the position vector of the point $(3,-2,\alpha)$ is 7 units then find all possible values of α.

$$\vec{OP} = 3\hat{i} - 2\hat{j} + \alpha\hat{k}$$

$$|\vec{OP}| = \sqrt{9+4+\alpha^2}$$

$$7 = \sqrt{13+\alpha^2}$$

$$49 = 13+\alpha^2$$

$$49-13 = \alpha^2$$

$$36 = \alpha^2$$

$$\boxed{\alpha = \pm 6}$$

20. I) Show that the vectors $2\hat{i}-3\hat{j}+4\hat{k}$ and $-4\hat{i}+6j-8\hat{k}$ *are* collinear.

$$\frac{-4}{2}=\frac{6}{-3}=\frac{-8}{4}$$

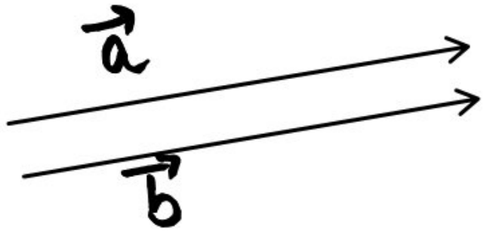
$-2=-2=-2$ are Collinear Vectors

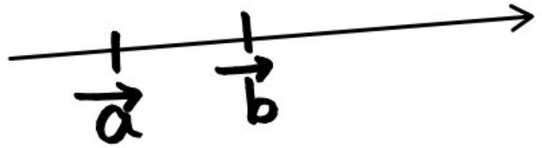
$$\vec{a}=\lambda\vec{b}$$

$$\vec{b}=-4\hat{i}+6\hat{j}-8\hat{k}$$

$$=-2(2\hat{i}-3\hat{j}+4\hat{k})$$

$$2\hat{i}-3\hat{j}+4\hat{k}=-2(2\hat{i}-3\hat{j}+4\hat{k})$$





$\vec{a}=\lambda\vec{b}$

$$\frac{a_1}{b_1}=\frac{a_2}{b_2}=\frac{a_3}{b_3}$$

20.ii) Write the value of p for which $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are parallel vectors.

$\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ $\quad \vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$

$$\frac{1}{3} = \frac{p}{2} = \frac{3}{9}$$

$$\frac{1}{3} = \frac{p}{2}$$

$$p = \frac{2}{3}$$

$$\frac{p}{2} = \frac{3}{9}$$

$$p = \frac{2 \times 3}{9_3} = \frac{2}{3}$$

$$p = \frac{2}{3}$$

iii) If $\vec{a} = p\hat{i} + 3\hat{j}$ and $\vec{b} = 4\hat{i} + p\hat{j}$ then find the values of p so that $\vec{a}$ and $\vec{b}$ may be parallel.

$\vec{a} = p\hat{i} + 3\hat{j}$ $\quad \vec{b} = 4\hat{i} + p\hat{j}$

$$\frac{4}{p} = \frac{p}{3}$$

$$p^2 = 12$$

$$p = \sqrt{12}$$

$$= \sqrt{4 \times 3}$$

$$\boxed{p = 2\sqrt{3}}$$ Ans

21.iii) What is the cosine of the angle which the vertex $\sqrt{2}\hat{i} + \hat{j} + \hat{k}$ makes with y-axis?

22.i) Find the mid-point of the vector joining the point P and Q having position vectors $2\hat{\imath} + 3\hat{\jmath} - 4\hat{k}$ and $4\hat{\imath} + \hat{\jmath} - 2\hat{k}\, respectively.$